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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/706,276

11/13/2003

Koji Ando

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EXAMINER

WILKINS III, HARRY D

ART UNIT

PAPER NUMBER

1753

MAIL DATE

DELIVERY MODE

09/20/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/706,276	<b>Applicant(s)</b> ANDO ET AL.	
	<b>Examiner</b> Harry D. Wilkins, III	<b>Art Unit</b> 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 13 August 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,4,9-13,16 and 18-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4,9-13,16 and 18-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 13 July 2007 has been entered.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1, 4 and 9-13, 16 and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Duggan (GB 2,122,592) in view of Atwood et al (US 3,785,944), Gandon et al (US 3,998,628), Baczek et al (US 4,256,553) and Cain (US 1,980,381).

Duggan teaches (see abstract and pages 1-2) a process for the extraction of metal values including (3) a solvent extraction step for a cuprous chloride/ferrous chloride solution using a water immiscible organic solvent and a step of stripping the copper from the organic solvent to produce a stripping product liquor containing the cuprous ion and an aqueous solution containing the ferrous ion. The liquor containing the cuprous ion was subjected to electrowinning to produce electrolytic copper and spent electrolyte.

Duggan teaches (see page 1, lines 34-55) that the cuprous-ferrous chloride solution was produced by leaching of complex sulphide ores using ferric chloride and or cupric chloride, but did not give details of the leaching method.

Atwood et al teach (see abstract, figure 2 and col. 3, line 51 to col. 4, line 15) teach a process of treating chalcopyrite ore ( $\text{CuFeS}_2$ ) to create a cuprous-ferrous chloride solution by (1) a chloride-aided leaching step ("OXIDATION STAGE") for leaching the copper material (chalcopyrite) in the presence of chlorine in an acidic, aqueous chloride solution to produce a leaching product liquor containing copper ion and a residue containing elemental sulfur and (2) a copper ion reduction step ("REDUCING STAGE") for reducing the leaching product liquor in the presence of a chalcopyrite reductant to produce a reduction product liquor containing cuprous ions. It should be noted that Atwood et al teach feeding partially reacted chalcopyrite to the leaching step (using the partially reacted solids from the "REDUCING STAGE"). However, as noted by Applicant's own claim 9, such use of partially reacted copper source material was within the scope of claim 1.

Therefore, it would have been obvious to one of ordinary skill in the art to have made the cuprous/ferrous chloride solution to be separated by the method of Duggan by the process of Atwood et al because the process of Atwood et al was able to readily form the desired solution without producing undesired or environmentally harmful by-products such as sulfuric acid.

However, Atwood et al do not teach specifically that the leaching step occurs with chlorine gas continually blown into the slurry and does not teach or suggest maintaining the oxidation reduction potential within the claimed range.

Gandon et al teach (see abstract, col. 3, lines 5-26 and 40-53 and col. 4, lines 10-15) teach a similar process of treating iron and copper sulphide containing ores, such as chalcopyrite ( $\text{CuFeS}_2$ ), to create a copper-iron chloride solution. The process includes grinding the ore and adding the powdered ore to water to form a slurry and blowing chlorine gas into the slurry to effect the reaction. Gandon et al further teach (see Examples) using slurry concentrations in the range of 205-380 g/L, leaching temperatures of (see col. 3, lines 17-22) 90-105°C, and an oxidation reduction potential in the range of (see col. 3, lines 12-16) 450-650 mV. Gandon et al teach (see abstract) that the specific treatment conditions disclosed permitted excellent separation of the metal from the sulfur and also permitted preferential extraction of copper over iron.

Therefore, it would have been obvious to one of ordinary skill in the art to have conducted the leaching step ("OXIDATION STAGE") of Atwood et al at the specific conditions disclosed by Gandon et al in order to achieve the advantages disclosed by

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Gandon et al, namely, excellent separation of the metal from the sulfur and also preferential extraction of copper over iron.

Atwood et al fail to teach control of the size of the chalcopyrite particle size. Although Gandon et al teach maintaining ore particle sizes below 100 microns, there is no suggestion that the size was known to be result effective.

However, Baczek et al teach (see col. 4, lines 27-35) that the size of the milled chalcopyrite particles was a known result effective variable in a copper ore chemical processes that effected the rate of reaction and the extent of reaction.

Therefore, it would have been with the ability of one of ordinary skill in the art to have optimized the size of the chalcopyrite particle diameter in order to have optimized the rate and completion of the reaction of Atwood et al.

Since Baczek et al teach that the particle diameter affected the reaction rate and completion, it would have been obvious to one of ordinary skill in the art to have determined the requisite temperature required for completion of the reaction.

With respect to the limitation that the temperature of the reducing step occurred at at least the temperature level A given by formula 1, temperature was a known result effective variable with respect to rate of reaction, and, thus, it would have been obvious to one of ordinary skill in the art to have optimized the temperature at which the reducing step occurred.

With respect to the limitation that the oxidation-reduction potential in the copper ion reducing step was 0 to 400 mV, Atwood et al teach (see figure 2) complete reduction of copper ions to the cuprous (+1) state. Thus, one of ordinary skill in the art

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would have considered the reduction step to inherently have an oxidation-reduction potential within the claimed range because it was fully capable of reducing all the copper ions to the +1 state while avoiding precipitation of copper or iron.

The combination of Duggan and Atwood et al do not teach a step of iron electrowinning of the aqueous solution containing the ferrous ion.

However, Cain teaches the concept of (5) producing electrolytic iron by electrowinning a ferrous chloride solution.

Therefore, it would have been obvious to one of ordinary skill in the art to have performed electrowinning of the aqueous solution containing the ferrous ion as taught by Cain in order to also create pure iron from the chalcopryite ore of Atwood et al. Since the chalcopryite ore contained iron, then without the iron electrowinning step, iron would have continued to build-up within the process solution and caused problems when the solution became saturated with ferrous/ferric ions.

Regarding the claim feature of the copper electrowinning step being effected in a divided electrolysis tank, Duggan teaches (see page 2, lines 24-40) using a divided electrowinning cell with the stripping product liquor being fed to the cathode chamber and a ferrous chloride solution being fed to the anolyte chamber. It would have been obvious to one of ordinary skill in the art to have fed the spent catholyte (containing ferrous chloride) from the iron electrowinning cell to the anode chamber of the copper electrowinning cell in order to have regenerated the ferric chloride solution to be returned to the first oxidation stage to reduce the overall waste generated by the process.

Regarding the claim feature of the diaphragm water permeation rate, it would have been within the ability of one of ordinary skill in the art to have selected an optimum diaphragm for the divided electrowinning cell.

Regarding the claim feature of recycling spent catholyte as the aqueous solution for stripping in the solvent extraction step and recycling spent anolyte as the leachate in the leaching step, it would have been obvious to one of ordinary skill in the art to have recycled the spent copper electrowinning catholyte to be the aqueous stripping solution and the spent copper electrowinning anolyte (previously the spent iron electrowinning catholyte) to be the chloride leaching solution in order to reduce waste in the process. Recycling of streams is a well known chemical engineering expedient in order to reduce overall waste produced by a process.

Regarding claim 4, based on the values in figure 2 of Atwood et al, the concentration of chloride ion was controlled to 345 g/L.

Regarding claim 9, Atwood et al suggest (see figures 1 and 2) recycling the residue from the reduction stage to the oxidation stage.

Regarding claims 10 and 11, the solvent extraction step of Duggan utilized an organic solvent. The solvent was considered to be 100% of the volume.

Regarding claim 12, it would have been obvious to one of ordinary skill in the art to have optimized the concentration of the stripping solution of Duggan in order to optimize the concentration of the solution for copper electrowinning.

Regarding claim 13, it would have been obvious to one of ordinary skill in the art to have found the optimum temperature at which to have operated the stripping process



of Duggan to have optimized the efficiency of the stripping to ensure enough copper was extracted from the organic solvent.

Regarding claim 16, since the anolyte contained iron ions and dissolved chlorine, it would have been obvious to one of ordinary skill in the art to have increased the pressure on the catholyte side of the diaphragm in order to have prevented anolyte from flowing into the catholyte. One of ordinary skill in the art was aware that increasing the hydraulic head, such as by increasing the height of the liquid, was a manner in which adjacent liquids could be adapted to have different pressures.

Regarding claim 18, Cain teaches electrowinning of iron in a divided electrolysis cell. It would have been obvious to one of ordinary skill in the art to have optimized the flow rates of anolyte and catholyte in order to have achieved optimum current density and voltage profiles.

Regarding claims 19 and 20, Cain teaches (see figure and paragraph spanning pages 3 and 4) preliminary sulfidation treatment of the electrolyte.

Regarding 21, it would have been obvious to one of ordinary skill in the art to have conducted appropriate processing of the sludge produced by the leaching process in order to provide adequate recovery of expensive precious metals. Such process are well known in the art of metal ore processing.

5. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Duggan (GB 2,122,592) and Atwood et al (US 3,785,944), Gandon et al (US 3,998,628), Baczek et al (US 4,256,553) and Cain (US 1,980,381) as applied to claim 1 above, and further in view of Subramanian et al (US 4,229,270).

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Duggan and Atwood et al fail to teach a second electrorefining step producing silver slime.

However, Subramanian et al teach (see col. 1, lines 10-42) using impure copper deposits (such as those formed by the copper electrowinning process of Duggan), as anodes in an electrorefining cell to produce pure copper and recoverable silver slime.

Therefore, it would have been obvious to one of ordinary skill in the art to have performed a second electrowinning step, i.e.-electrorefining, in order to fore a pure copper product and to recover any silver or other metal impurities.

### ***Response to Arguments***

6. Applicant's arguments filed 13 July 2007 have been fully considered but they are not persuasive. Applicant has argued that none of the references provide a reason or suggestion for combination.

In response, as can be seen in the rejection grounds above, the examiner has set forth technical reasons why one of ordinary skill in the art would have combined the teachings of the various references in this manner.

### ***Conclusion***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 7:45am-4:15pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on 571-272-1293. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Harry D Wilkins, III  
Primary Examiner  
Art Unit 1753

hdw